Grade 4
Mathematics
Item Specifications

Missouri
DEPARTMENT OF ELEMENTARY & SECONDARY
EDUCATION

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Introduction

In 2014 Missouri legislators passed House Bill 1490, mandating the development of the Missouri Learning Expectations. In April of 2016, these Missouri Learning Expectations were adopted by the State Board of Education. Groups of Missouri educators from across the state collaborated to create the documents necessary to support the implementation of these expectations.

One of the documents developed is the item specification document, which includes all Missouri grade level/course expectations arranged by domains/strands. It defines what could be measured on a variety of assessments. The document serves as the foundation of the assessment development process.

Although teachers may use this document to provide clarity to the expectations, these specifications are intended for summative, benchmark, and large-scale assessment purposes.

Components of the item specifications include:

Expectation Unwrapped breaks down a list of clearly delineated content and skills the students are expected to know and be able to do upon mastery of the Expectation.

Depth of Knowledge (DOK) Ceiling indicates the highest level of cognitive complexity that would typically be assessed on a large scale assessment. The DOK ceiling is not intended to limit the complexity one might reach in classroom instruction.

Item Format indicates the types of items used in large scale assessment. For each expectation, the item format specifies the type best suited for that particular expectation.

Text Types suggests a broad list of text types for both literary and informational expectations. This list is not intended to be all inclusive: other text types may be used in the classroom setting. The expectations were written in grade level bands; for this reason, the progression of the expectations relies upon increasing levels of quantitative and qualitative text complexities.

Grade 4 Mathematics

Content Limits/Assessment Boundaries are parameters that item writers should consider when developing a large scale assessment. For example, some expectations should not be assessed on a large scale assessment but are better suited for local assessment.

Sample stems are examples that address the specific elements of each expectation and address varying DOK levels. The sample stems provided in this document are in no way intended to limit the depth and breadth of possible item stems. The expectation should be assessed in a variety of ways.

Grade 4 Mathematics

Frequently asked questions for Item Specification and Sample Stems

1. What is the purpose of the Item Specification document?
Historically, Item Specification documents are written for test item writers. In Missouri, this document was seen as a resource for not only item writers, but teachers as well. The unwrapped section should provide more detail on the meaning of the standard and the sample stems should provide example items that also help clarify the standard. In this update, the language used in the Expanded Expectations document was included to merge the two documents for easier access. In some standards a "Notes" section was added to provide additional information.

2. Why do some unwrapped sections have the same few sentences at the beginning?
For standards that have multiple parts and are listed as sub expectations, e.g., NF.C.5.b, the first part highlights the intent of that standard series. Often, these standards should be taught together as they develop a bigger idea or concept.

3. Why is the Fluency definition only on some standards?
Certainly, students having experience using different strategies and picking the strategy they feel best for given situations is important to improving student knowledge in mathematics. The Missouri Educators working on the document felt it important to highlight areas where student access to multiple strategies would provide the greatest support. Listing fluency in all standards would likely lessen the impact needed.

4. What does the "e.g." mean when listed in the unwrapped section?
The "e.g." is a way to highlight a list of examples, ideas, or concepts. It is **not** an exhaustive list, nor is it intended to represent the best examples. It is merely a partial list to provide some examples.

5. What does "with or without context" mean?
This phrase was used to highlight that the math problems might have some situational context or could possibly be a strictly number or symbol situation. The Educators working on this update wanted the focus to be on using math to solve problem situations rather than a focus on "real world" problems.

6. Are the Sample Stems examples of summative test items?
The Sample Stems could be a classroom item or possibly an assessment item. In some cases, the problem used would have to be adjusted to use on a Statewide assessment. The goal was to give students and teachers a problem that aligns to the standard. The Stems provided in the document are an example. The educators assisting with the update in some cases created more than one example and those are listed at the bottom of the document. All examples are good, some fit better on the page within the Item Specification which have determined those shown in both places.

7. Why are there no answers listed with the Sample Stems?
The focus of the Sample Stems should be on the work students can demonstrate to indicate their level of understanding for the given standard. While the answer is one component, when given, it frequently becomes the focus which does not provide important information in the learning process.

8. What does "No Limits" mean in the Limits and Boundaries section?
Where there are no limits or boundaries to be listed, "No Limits" was used to indicate this situation and help those using the document understand that it wasn't an oversight. IMPORTANT NOTE: if the standard itself or the cluster heading lists a specific limit, e.g., specific denominators, size or type of number, that was not duplicated in the Limits section.

9. Why do some words show a short definition?
While this does not serve as a replacement for a glossary, there were terms within the unwrapping that the committee felt should have meaning included. This occurs in the standard where it specifically addresses the concept in the standard, e.g., cardinality, trapezoid.

10. Why are Kindergarten and Grade 1 Sample Stems a bit different?
Students in Kindergarten and Grade 1 are beginning readers, so teachers should expect to read problems to the students rather than only providing problems to be solved.

Grade 4 Mathematics

Mathematics		4.NBT.A.1
NBT **A** **1**	**Number Sense and Operations in Base Ten** **Use place value understanding and properties of operations to perform multi-digit arithmetic with numbers up to one million.** Round multi-digit whole numbers to any place.	

Expectation Unwrapped – the intent of this section is to describe the elements of the expectation, but are NOT additional standards or expectations.

The student will use place value understanding to round multi-digit whole numbers to any place. Rounding is used to adjust the number based on the context of the situation, e.g., round to the nearest hundred. Estimation is used to approximate answers without actually computing. Rounding and estimation are used together to approximate solutions or estimate values.

Sample Stems

Dillon has 3,674 baseball cards in his collection. Kayla has 457 less. What are some ways to round the numbers to estimate the number of cards they have together? Explain how your rounding could impact the estimation.

Additional Stems for 4th Grade Found at End of Document.

State Assessment Content Limits/Boundaries - Classroom Work Should Extend Beyond These Limits

No Limits.

Calculator Designation

NO – a calculator will not be available for items

DOK Ceiling: 3

Item Format: Selected Response, Constructed Response, Technology Enhanced

Grade 4 Mathematics

Mathematics		4.NBT.A.2
NBT A 2	**Number Sense and Operations in Base Ten** **Use place value understanding and properties of operations to perform multi-digit arithmetic with numbers up to one million.** Read, write and identify multi-digit whole numbers up to one million using number names, base ten numerals and expanded form.	

Expectation Unwrapped – the intent of this section is to describe the elements of the expectation, but are NOT additional standards or expectations.

The student will read, write, and identify whole numbers within one million using base ten numerals, number names and expanded form.

The student will be able to convert between number names (word form), base ten numerals (standard form) and expanded form.

Note:
Expanded form is not the same as **expanded notation**, e.g., **expanded form** is expressed 537 = 500 + 30 + 7; **expanded notation** is expressed 537 = (5x100) + (3x10) + (7x1). According to the standard, **expanded notation** is not appropriate for Missouri grade level assessment for fourth grade.

Based on the wording in the standards ***base ten numerals*** will replace ***standard form; number names*** will replace ***word form; and expanded form*** *will be used.*

Sample Stems

Arrowhead Stadium will hold seventy-six thousand, four hundred sixteen people. Trinity writes this number as 76,000,416. Kevin writes 76,000 + 416. Aerick writes 70,000 + 6,000 + 400 + 16. Dutton writes 7 ten thousands + 6 thousands + 4 hundreds + 16 ones. Sky writes 76,416. Identify all the people that represented the number accurately and explain any errors some students might have made.

Additional Stems for 4th Grade Found at End of Document.

State Assessment Content Limits/Boundaries - Classroom Work Should Extend Beyond These Limits

No Limits.

Calculator Designation

NO – a calculator will not be available for items

DOK Ceiling: 3

Item Format: Selected Response, Constructed Response, Technology Enhanced

Grade 4 Mathematics

Mathematics		4.NBT.A.3
NBT A 3	**Number Sense and Operations in Base Ten** **Use place value understanding and properties of operations to perform multi-digit arithmetic with numbers up to one million.** Compare two multi-digit numbers using the symbols >, = or <, and justify the solution.	
Expectation Unwrapped – the intent of this section is to describe the elements of the expectation, but are NOT additional standards or expectations. The student will compare, describing both what is similar and different, between two multi-digit numbers using the symbols for greater than, equal to, or less than and justify the solution, e.g., using words, models.		**Sample Stems** Use digits 1, 2, 3, 4, 6, 7, 8, 9 exactly once to make the following true: _ _ _ _ > _ _ _ _ Now replace one digit with a 5 so that the > sign would have to become a < sign to make the statement true. Which digit did you change and why? Additional Stems for 4th Grade Found at End of Document.
State Assessment Content Limits/Boundaries - Classroom Work Should Extend Beyond These Limits No Limits.		**Calculator Designation** **NO** – a calculator will not be available for items
DOK Ceiling: 3		
Item Format: Selected Response, Constructed Response, Technology Enhanced		

Grade 4 Mathematics

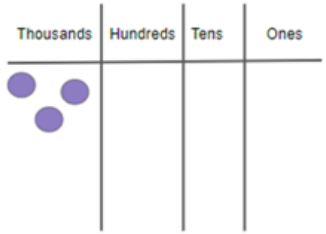
Mathematics		4.NBT.A.4
NBT A 4	**Number Sense and Operations in Base Ten** **Use place value understanding and properties of operations to perform multi-digit arithmetic with numbers up to one million.** Understand that in a multi-digit whole number, a digit represents 10 times what it would represent in the place to its right.	

Expectation Unwrapped – the intent of this section is to describe the elements of the expectation, but are NOT additional standards or expectations.

The student will demonstrate understanding that in a multi-digit whole number, a digit in any place represents ten times what it represents in the place to its right.

Sample Stems

Using the place value chart below, show the same value in the hundreds place.



Additional Stems for 4th Grade Found at End of Document.

State Assessment Content Limits/Boundaries - Classroom Work Should Extend Beyond These Limits

Limited to the digit to the immediate right or one place value.

Calculator Designation

NO – a calculator will not be available for items

DOK Ceiling: 3

Item Format: Selected Response, Constructed Response, Technology Enhanced

Grade 4 Mathematics

Mathematics		4.NBT.A.5
NBT A 5	**Number Sense and Operations in Base Ten** **Use place value understanding and properties of operations to perform multi-digit arithmetic with numbers up to one million.** Demonstrate fluency with addition and subtraction of whole numbers.	

Expectation Unwrapped – the intent of this section is to describe the elements of the expectation, but are NOT additional standards or expectations.

The student will fluently add and subtract whole numbers up to one million using strategies based on place value, properties of operations and/or the relationship between addition and subtraction.

The student will communicate their reasoning in solving problems.

Mathematical Fluency is more than a quick answer on a timed test. Students demonstrate Fluency when they do mathematics using an ***appropriate strategy*** in a reasonable amount of time, ***knowing multiple processes*** and can apply or adapt strategies to find a correct solution.

The student will demonstrate or recognize alternate approaches to solving problems, with or without context, involving addition and subtraction with or without context.

Sample Stems

Toni and Jeni are working to solve problems and explain their reasoning.

Looking at 527 + 391 Toni sees 3 different strategies to find a solution. Jeni sees 4 strategies. What are some strategies to solve this problem?

How are the strategies selected similar or different if the problem was changed to be 527 – 391?

Additional Stems for 4th Grade Found at End of Document.

State Assessment Content Limits/Boundaries - Classroom Work Should Extend Beyond These Limits

No Limits.

Calculator Designation

NO – a calculator will not be available for items

DOK Ceiling: 3

Item Format: Selected Response, Constructed Response, Technology Enhanced

Grade 4 Mathematics

Mathematics		4.NBT.A.6
NBT A 6	**Number Sense and Operations in Base Ten** **Use place value understanding and properties of operations to perform multi-digit arithmetic with numbers up to one million.** Multiply a whole number of up to four digits by a one-digit whole number and multiply two two-digit numbers, and justify the solution.	

Expectation Unwrapped – the intent of this section is to describe the elements of the expectation, but are NOT additional standards or expectations.

The student will multiply a whole number of up to four digits by a one-digit whole number, and multiply two two-digit numbers, using properties of operations, e.g., distributive property, or strategies based on place value, e.g., partial products, repeated addition.

The student will justify solutions using various methods, e.g., illustrate the calculation using equations, explain in words, use rectangular arrays, area models and/or other models.

Note:
While students will be learning how to use properties of operations, i.e., associative, commutative, distributive, identity, the focus is not on identifying or naming the properties.

Sample Stems

Find the product of the following problem and use equations, rectangular arrays, or area models to help justify your solution.

27 x 23

Additional Stems for 4th Grade Found at End of Document.

State Assessment Content Limits/Boundaries - Classroom Work Should Extend Beyond These Limits

No Limits.

Calculator Designation

NO – a calculator will not be available for items

DOK Ceiling: 3

Item Format: Selected Response, Constructed Response, Technology Enhanced

Grade 4 Mathematics

Mathematics		4.NBT.A.7
NBT A 7	**Number Sense and Operations in Base Ten** **Use place value understanding and properties of operations to perform multi-digit arithmetic with numbers up to one million.** Find whole-number quotients and remainders with up to four-digit dividends and one-digit divisors, and justify the solution.	

Expectation Unwrapped – the intent of this section is to describe the elements of the expectation, but are NOT additional standards or expectations.

The student will find whole-number quotients and remainders with up to four-digit dividends and one-digit divisors, using strategies based on the relationship between the dividend and the divisor, the properties of operations and/or the relationship between multiplication and division.

The student will justify (explain) the calculation with representations using words, numbers, or models.

Note:
While students will be learning how to use properties of operations, i.e., associative, commutative, distributive, identity, the focus is not on identifying or naming the properties.

4th grade work with division continues to focus on whole numbers, so any remainders should be expressed using a whole number, e.g., 10 R3, 10 r3.

Sample Stems

Two students are discussing whether $4{,}537 \div 5$ will or will not have a remainder. Without calculating the solution, explain how they will know. Use words, numbers, or models to help explain your reasoning.

Additional Stems for 4th Grade Found at End of Document.

State Assessment Content Limits/Boundaries - Classroom Work Should Extend Beyond These Limits

No Limits.

Calculator Designation

NO – a calculator will not be available for items

DOK Ceiling: 2

Item Format: Selected Response, Constructed Response, Technology Enhanced

Grade 4 Mathematics

Mathematics		4.NF.A.1
NF A 1	**Number Sense and Operations in Fractions** **PRIORITY STANDARD** **Extend understanding of fraction equivalence and ordering. (Limit denominators to 2, 3, 4, 5, 6, 8, 10, 12 and 100.)** Explain and/or illustrate why two fractions are equivalent.	

Expectation Unwrapped – the intent of this section is to describe the elements of the expectation, but are NOT additional standards or expectations.

The student will demonstrate that two fractions are equivalent when there are equal parts of the same size whole. Explanations can be supported using drawings, models, or manipulatives, e.g., fraction bars, fraction circles.

The student will use number lines to demonstrate that two fractions are equivalent if they are the same distance from zero.

Mathematical Fluency is more than a quick answer on a timed test. Students demonstrate Fluency when they do mathematics using an ***appropriate strategy*** in a reasonable amount of time, ***knowing multiple processes*** and can apply or adapt strategies to find a correct solution.

The student will explain or illustrate multiple strategies to solve problems with or without context showing how two fractions are equivalent.

Sample Stems

Jenny says that $\frac{1}{4}$ is equal to $\frac{2}{5}$ because she added one to both the numerator and denominator. Do you agree that $\frac{1}{4}$ is equal to $\frac{2}{5}$?

Explain why or why not using pictures, words, or models.

Additional Stems for 4th Grade Found at End of Document.

State Assessment Content Limits/Boundaries - Classroom Work Should Extend Beyond These Limits

Limit fractions to less than one.

Calculator Designation

NO – a calculator will not be available for items

DOK Ceiling: 3

Item Format: Selected Response, Constructed Response, Technology Enhanced

Grade 4 Mathematics

Mathematics		4.NF.A.2
NF A 2	**Number Sense and Operations in Fractions** **PRIORITY STANDARD** **Extend understanding of fraction equivalence and ordering. (Limit denominators to 2, 3, 4, 5, 6, 8, 10, 12 and 100.)** Recognize and generate equivalent fractions.	

Expectation Unwrapped – the intent of this section is to describe the elements of the expectation, but are NOT additional standards or expectations.

The student will recognize and generate equivalent fractions (of the same size whole) using words, numbers or models, e.g., fraction bars, fraction circles and number lines.

The student will explain why the fractions are equivalent, including fractions that are equal to 1, e.g., $\frac{8}{8}$.

Note:
Instructional focus should include students recognizing various equivalent forms which may, in certain situations, be better answers, e.g., $\frac{4}{8}$, $\frac{6}{12}$, are acceptable and equivalent forms of $\frac{1}{2}$. Understanding the relationship and equivalence is more important than using a particular form.

Mathematical Fluency is more than a quick answer on a timed test. Students demonstrate Fluency when they do mathematics using an ***appropriate strategy*** in a reasonable amount of time, ***knowing multiple processes*** and can apply or adapt strategies to find a correct solution.

The student will recognize and generate multiple strategies to solve problems with or without context involving equivalent fractions.

Sample Stems

Students are working to determine whether two fractions are equivalent. One group is working on the fractions $\frac{9}{12}$ and $\frac{6}{8}$. Use words, numbers, or models to help explain whether these fractions are equivalent.

Additional Stems for 4th Grade Found at End of Document.

State Assessment Content Limits/Boundaries - Classroom Work Should Extend Beyond These Limits

Limit fractions to be from zero to one, inclusive of zero and one.

Calculator Designation

NO – a calculator will not be available for items

DOK Ceiling: 2

Item Format: Selected Response, Constructed Response, Technology Enhanced

Grade 4 Mathematics

Mathematics		4.NF.A.3
NF A 3	**Number Sense and Operations in Fractions** **PRIORITY STANDARD** **Extend understanding of fraction equivalence and ordering. (Limit denominators to 2, 3, 4, 5, 6, 8, 10, 12 and 100.)** Compare two fractions using the symbols >, = or <, and justify the solution.	

Expectation Unwrapped – the intent of this section is to describe the elements of the expectation, but are NOT additional standards or expectations.

The student will compare two fractions with different numerators and/or denominators, e.g., by creating common denominators or numerators, or by comparing to a number such as $\frac{1}{2}$, etc.

The student will justify their comparison, e.g., using number lines, manipulatives, models, then communicate the results of the comparison using the symbols <, > or =.

Mathematical Fluency is more than a quick answer on a timed test. Students demonstrate Fluency when they do mathematics using an ***appropriate strategy*** in a reasonable amount of time, ***knowing multiple processes*** and can apply or adapt strategies to find a correct solution.

The student will use and explain multiple strategies to solve problems with or without context involving multiplication of multi-digit whole numbers and decimals to the hundredths place.

Sample Stems

Using the numbers 2, 3, 4 and 5 exactly one time, place these numbers in the boxes to make each sentence true.

$\frac{\square}{\square} > \frac{2}{3}$ $\frac{\square}{\square} < \frac{1}{2}$

What other arrangement of numbers will make each sentence true? Use words, pictures, number lines or other strategies to justify how you know.

Additional Stems for 4th Grade Found at End of Document.

State Assessment Content Limits/Boundaries - Classroom Work Should Extend Beyond These Limits

Limit fractions to be from zero to one, inclusive of zero and one.

Calculator Designation

NO – a calculator will not be available for items

DOK Ceiling: 3

Item Format: Selected Response, Constructed Response, Technology Enhanced

Grade 4 Mathematics

Mathematics		4.NF.B.4
NF **B** **4**	**Number Sense and Operations in Fractions** **Extend understanding of operations on whole numbers to fraction operations.** Understand addition and subtraction of fractions as joining/composing and separating/decomposing parts referring to the same whole.	

Expectation Unwrapped – the intent of this section is to describe the elements of the expectation, but are NOT additional standards or expectations.

The student will demonstrate understanding of addition and subtraction with fractions as joining/composing and separating/decomposing parts referring to the same size whole, e.g., you can only add $\frac{1}{5}+\frac{2}{5}$ and get $\frac{3}{5}$ if the $\frac{1}{5}$ and $\frac{2}{5}$ refer to the same size whole.

Note:
Visual fraction models, e.g., manipulatives or models, can be used to support compositions or decompositions.

Fractions greater than one can be used for this standard as long as they have the same denominator and are referring to the same size whole.

Sample Stems

Josh used $\frac{1}{4}$ of a jug of milk to make a cake at his house. Kate used $\frac{1}{4}$ of a carton of milk for making cookies at her house. Kate said that in all, they used $\frac{1}{2}$ of a container. Is that a true statement? Why or why not?

Additional Stems for 4th Grade Found at End of Document.

State Assessment Content Limits/Boundaries - Classroom Work Should Extend Beyond These Limits

No Limits.

Calculator Designation

NO – a calculator will not be available for items

DOK Ceiling: 3

Item Format: Selected Response, Constructed Response, Technology Enhanced

Grade 4 Mathematics

Mathematics		4.NF.B.5
NF B 5	**Number Sense and Operations in Fractions** **Extend understanding of operations on whole numbers to fraction operations.** Decompose a fraction into a sum of fractions with the same denominator and record each decomposition with an equation and justification.	

Expectation Unwrapped – the intent of this section is to describe the elements of the expectation, but are NOT additional standards or expectations.

The student will decompose a fraction into a sum of fractions with the same denominator in more than one way, recording each decomposition with an equation, e.g., $\frac{3}{5} = \frac{1}{5} + \frac{2}{5}$; $2\frac{1}{8} = 1 + 1 + \frac{1}{8} = \frac{8}{8} + \frac{8}{8} + \frac{1}{8} = \frac{17}{8}$.

The student will justify decompositions, e.g., using number lines, bar models, manipulatives, drawings.

Note:
All decompositions should be shown with the same denominator.

Fractions greater than one can be used for this standard as long as they have the same denominator and are referring to the same size whole.

Mathematical Fluency is more than a quick answer on a timed test. Students demonstrate Fluency when they do mathematics using an ***appropriate strategy*** in a reasonable amount of time, ***knowing multiple processes*** and can apply or adapt strategies to find a correct solution.

The student will use and explain multiple strategies to solve problems with or without context involving decomposing a fraction into a sum of fractions with the same denominator.

Sample Stems

Katie and Jason ate $\frac{7}{8}$ of a pizza together. What are the different possibilities of what each person might have eaten? Represent your possibilities with an equation.

Additional Stems for 4th Grade Found at End of Document.

State Assessment Content Limits/Boundaries - Classroom Work Should Extend Beyond These Limits

No Limits.

Calculator Designation

NO – a calculator will not be available for items

DOK Ceiling: 3

Item Format: Selected Response, Constructed Response, Technology Enhanced

Grade 4 Mathematics

Mathematics		4.NF.B.6
NF B 6	**Number Sense and Operations in Fractions** **Extend understanding of operations on whole numbers to fraction operations.** Solve problems involving adding and subtracting fractions and mixed numbers with like denominators.	**PRIORITY STANDARD**

Expectation Unwrapped – the intent of this section is to describe the elements of the expectation, but are NOT additional standards or expectations.

The student will solve problems, with or without context, involving adding and subtracting fractions and mixed numbers with like denominators and using words, numbers, or models to support the sums and differences, e.g., $2\frac{1}{8}+\frac{3}{8}=2\frac{4}{8}$; $3\frac{1}{3}+2\frac{2}{3}=5\frac{3}{3}$; $5\frac{3}{5}-\frac{2}{5}=5\frac{1}{5}$.

Note:
Instructional focus should include students recognizing various equivalent forms which may, in certain situations, be better answers, e.g., $\frac{4}{8}$, $\frac{6}{12}$, are acceptable and equivalent forms of $\frac{1}{2}$. Understanding the relationship and equivalence is more important than using a particular form.

For problems where renaming is needed, e.g., $6\frac{1}{5}-3\frac{4}{5}$, students should have the opportunity to extend whole number strategies as well as explore methods like adding $\frac{1}{5}$ to both numbers which keeps the difference constant. The problem becomes $6\frac{2}{5}-4$. Additional strategies include making an equivalent fraction, or changing one of your wholes, e.g., $6\frac{1}{5}$ to $5\frac{6}{5}$ in this example.

Mathematical Fluency is more than a quick answer on a timed test. Students demonstrate Fluency when they do mathematics using an ***appropriate strategy*** in a reasonable amount of time, ***knowing multiple processes*** and can apply or adapt strategies to find a correct solution.

The student will use and explain multiple strategies to solve problems with or without context involving adding and subtracting fractions and mixed numbers with like denominators.

Sample Stems

Jason made brownies for the guests at his family's picnic. At the picnic, the guests ate $\frac{5}{12}$ of the brownies. Later that night, the family ate more of the brownies. The next morning, $\frac{5}{12}$ of the brownies were left in the pan. How much of the brownies did the family eat later that night? What is another fraction you can write that is equal to this fraction?

Additional Stems for 4th Grade Found at End of Document.

State Assessment Content Limits/Boundaries - Classroom Work Should Extend Beyond These Limits

Limit subtraction problems to not require renaming, e.g., $3\frac{1}{3}-2\frac{2}{3}$, where the $3\frac{1}{3}$ would need to be renamed to $2\frac{4}{3}$ or another equivalent fraction.

Calculator Designation

NO – a calculator will not be available for items

DOK Ceiling: 3

Item Format: Selected Response, Constructed Response, Technology Enhanced

Grade 4 Mathematics

Mathematics		4.NF.B.7
NF	**Number Sense and Operations in Fractions**	
B	**Extend understanding of operations on whole numbers to fraction operations.**	
7	Apply and extend previous understandings of multiplication to multiply a fraction by a whole number.	

Expectation Unwrapped – the intent of this section is to describe the elements of the expectation, but are NOT additional standards or expectations.

The student will apply and extend previous understandings of multiplication to multiply a fraction by a whole number and use modeling to justify their reasoning. As an example, $10 \times \frac{2}{5}$ could be represented by 10 groups of $\frac{2}{5}$ which is equivalent to 20 fifths or 4 wholes. Since multiplication can use the commutative property, this situation could also be represented by $\frac{2}{5} \times 10$ or $\frac{2}{5}$ of a group of 10.

Note:
Instructional focus should include students recognizing various equivalent forms which may, in certain situations, be better answers, e.g., $\frac{18}{8}$, or $2\frac{2}{8}$ are acceptable and equivalent forms of $2\frac{1}{4}$. Understanding the relationship and equivalence is more important than using a particular form.

Sample Stems

Jay drew this model to represent $3 \times \frac{1}{5}$. What is the product? Explain how you know.

Additional Stems for 4th Grade Found at End of Document.

State Assessment Content Limits/Boundaries - Classroom Work Should Extend Beyond These Limits

Limit to multiplying a whole number by a fraction less than one.
Limit denominators to 2, 3, 4, 5, 6, 8, 10, 12 or 100.
Limit whole numbers to numbers ten or less.

Calculator Designation

NO – a calculator will not be available for items

DOK Ceiling: 3

Item Format: Selected Response, Constructed Response, Technology Enhanced

Grade 4 Mathematics

Mathematics		4.NF.B.8
NF B 8	**Number Sense and Operations in Fractions** **Extend understanding of operations on whole numbers to fraction operations.** Solve problems involving multiplication of a fraction by a whole number.	**PRIORITY STANDARD**

Expectation Unwrapped – the intent of this section is to describe the elements of the expectation, but are NOT additional standards or expectations.

The student will solve problems with or without context involving multiplication of a fraction by a whole number and justify the solution.

Note:
Instructional focus should include students recognizing various equivalent forms which may, in certain situations, be better answers, e.g., $\frac{18}{8}$, or $2\frac{2}{8}$ are acceptable and equivalent forms of $2\frac{1}{4}$. Understanding the relationship and equivalence is more important than using a particular form.

Mathematical Fluency is more than a quick answer on a timed test. Students demonstrate Fluency when they do mathematics using an ***appropriate strategy*** in a reasonable amount of time, ***knowing multiple processes*** and can apply or adapt strategies to find a correct solution.

The student will use and explain multiple strategies to solve problems with or without context involving multiplication of a fraction by a whole number.

Sample Stems

Linda feeds each of her three rescue dogs three scoops of dog food per day. Each scoop is $\frac{2}{3}$ cup. How much dog food does each dog receive? Support your solution by using words, numbers, or models.

Additional Stems for 4th Grade Found at End of Document.

State Assessment Content Limits/Boundaries - Classroom Work Should Extend Beyond These Limits

Limit to multiplying a whole number by a fraction less than one.
Limit denominators to 2, 3, 4, 5, 6, 8, 10, 12 or 100.
Limit whole numbers to numbers ten or less.

Calculator Designation

NO – a calculator will not be available for items

DOK Ceiling: 3

Item Format: Selected Response, Constructed Response, Technology Enhanced

Grade 4 Mathematics

Mathematics		4.NF.C.9
NF C 9	**Number Sense and Operations in Fractions** **Understand decimal notation for fractions, and compare decimal fractions. (Denominators of 10 or 100.)** Use decimal notation for fractions with denominators of 10 or 100.	

Expectation Unwrapped – the intent of this section is to describe the elements of the expectation, but are NOT additional standards or expectations.

The student will name an equivalent decimal when given a fraction with a denominator of 10 or 100, e.g., $\frac{4}{10} = 0.4$ which is equivalent to $\frac{40}{100}$ or 0.40.

Note:
The focus of 4th grade is to develop an understanding of decimal notation using decimal fractions (fractions with denominators of 10 or 100). Teachers should realize this is a representation that will grow, e.g., denominators can be greater than 100, i.e., 1000, 10000, etc.

At 4th grade, decimal fractions used should be less than one.

Sample Stems

Amy says $\frac{3}{10}$ can be written as the decimal 0.30. Is Amy correct? Explain why or why not.

Additional Stems for 4th Grade Found at End of Document.

State Assessment Content Limits/Boundaries - Classroom Work Should Extend Beyond These Limits

No Limit.

Calculator Designation

NO – a calculator will not be available for items

DOK Ceiling: 3

Item Format: Selected Response, Constructed Response, Technology Enhanced

Grade 4 Mathematics

Mathematics		4.NF.C.10
NF C 10	**Number Sense and Operations in Fractions** **PRIORITY STANDARD** **Understand decimal notation for fractions, and compare decimal fractions. (Denominators of 10 or 100.)** Understand that fractions and decimals are equivalent representations of the same quantity.	

Expectation Unwrapped – the intent of this section is to describe the elements of the expectation, but are NOT additional standards or expectations.

The student will show that fractions and decimals of the same quantity are equivalent representations.

The student will explain how the representations are equivalent to demonstrate their understanding. The explanation could include words, numbers, or models.

Note:
The focus of 4th grade is to develop an understanding of decimal notation using decimal fractions (fractions with denominators of 10 or 100). Teachers should realize this is a representation that will grow, e.g., denominators can be greater than 100, i.e., 1000, 10000, etc.

At 4th grade, decimal fractions used should be less than one.

Sample Stems

Use words, numbers, models, or other strategies to show that $\frac{65}{100}$ is equivalent to 0.65.

Additional Stems for 4th Grade Found at End of Document.

State Assessment Content Limits/Boundaries - Classroom Work Should Extend Beyond These Limits

No Limits.

Calculator Designation

NO – a calculator will not be available for items

DOK Ceiling: 3

Item Format: Selected Response, Constructed Response, Technology Enhanced

Grade 4 Mathematics

Mathematics		4.NF.C.11
NF C 11	**Number Sense and Operations in Fractions** **Understand decimal notation for fractions, and compare decimal fractions. (Denominators of 10 or 100.)** Read, write and identify decimals to the hundredths place using number names, base ten numerals and expanded form.	

Expectation Unwrapped – the intent of this section is to describe the elements of the expectation, but are NOT additional standards or expectations.

The student will read, write, and identify decimals to the hundredths place using base ten numerals, number names and expanded form.

The student will be able to convert between number names (word form), base ten numerals (standard form) and expanded form.

Note:
Expanded form is not the same as **expanded notation**, e.g., **expanded form** is expressed 5.37 = 5 + 0.3 + 0.07; **expanded notation** is expressed 5.37 = (5 x 1) + (3 x 0.1) + (7 x 0.01). According to the standard, **expanded notation** is not appropriate for Missouri grade level assessment for fourth grade.

Based on the wording in the standards, ***base ten numerals*** will replace ***standard form; number names*** will replace ***word form;*** and ***expanded form*** will be used.

Sample Stems

Describe the differences between the following two numbers.

8.67 8.76

Use the number names, place values to help support your descriptions.

Additional Stems for 4th Grade Found at End of Document.

State Assessment Content Limits/Boundaries - Classroom Work Should Extend Beyond These Limits

No Limits.

Calculator Designation

NO – a calculator will not be available for items

DOK Ceiling: 3

Item Format: Selected Response, Constructed Response, Technology Enhanced

Grade 4 Mathematics

Mathematics		4.NF.C.12
NF C 12	**Number Sense and Operations in Fractions** **PRIORITY STANDARD** **Understand decimal notation for fractions, and compare decimal fractions. (Denominators of 10 or 100.)** Compare two decimals to the hundredths place using the symbols >, = or <, and justify the solution.	

Expectation Unwrapped – the intent of this section is to describe the elements of the expectation, but are NOT additional standards or expectations.

The student will compare two decimals to the hundredths place by reasoning about their quantity.

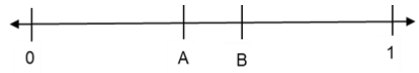
The student will justify their comparison, e.g., using number lines, one hundred grids, manipulatives, or drawings, then communicate the results of the comparison using the symbols <, > or =.

Mathematical Fluency is more than a quick answer on a timed test. Students demonstrate Fluency when they do mathematics using an ***appropriate strategy*** in a reasonable amount of time, ***knowing multiple processes*** and can apply or adapt strategies to find a correct solution.

The student will use and explain multiple strategies to solve problems with or without context involving comparing two decimals to the hundredths place.

Sample Stems

Joe and Ella estimated the height of a bench. Joe estimated that it was 0.6 m tall. Ella estimated that it was 0.48 m tall. They marked their estimates on the number line below. Identify which mark belongs to each student and justify your selection.



Additional Stems for 4th Grade Found at End of Document.

State Assessment Content Limits/Boundaries - Classroom Work Should Extend Beyond These Limits

No Limits.

Calculator Designation

NO – a calculator will not be available for items

DOK Ceiling: 3

Item Format: Selected Response, Constructed Response, Technology Enhanced

Grade 4 Mathematics

Mathematics		4.RA.A.1
RA **A** **1**	**Relationships and Algebraic Thinking** **Use the four operations with whole numbers to solve problems** Multiply or divide to solve problems involving a multiplicative comparison.	
Expectation Unwrapped – the intent of this section is to describe the elements of the expectation, but are NOT additional standards or expectations. The student will multiply or divide to solve problems with or without context. This will involve students using two quantities that could be multiplied together or using division to find the missing factor.		**Sample Stems** Brad ran 5 laps. Gerry ran three times as many laps as Brad. How many laps did Gerry run? Additional Stems for 4th Grade Found at End of Document.
State Assessment Content Limits/Boundaries - Classroom Work Should Extend Beyond These Limits Limit factors to whole numbers less than or equal to 12.		**Calculator Designation** **NO** – a calculator will not be available for items
DOK Ceiling: 3		
Item Format: Selected Response, Constructed Response, Technology Enhanced		

Grade 4 Mathematics

Mathematics		4.RA.A.2
RA **A** **2**	**Relationships and Algebraic Thinking** **PRIORITY STANDARD** **Use the four operations with whole numbers to solve problems** Solve multi-step whole number problems involving the four operations and variables and using estimation to interpret the reasonableness of the answer.	
Expectation Unwrapped – the intent of this section is to describe the elements of the expectation, but are NOT additional standards or expectations. The student will solve multi-step problems, with or without context, posed with whole numbers and having whole-number answers involving any of the four operations. Represent problems using equations with a letter or symbol standing for the unknown quantity. Students should be able to describe how to use estimation to assess reasonableness of answers. Note: In situations using measurement use whole number units including inches, feet, yards, miles, kilometers, meters, centimeters, millimeters, kilograms, grams, pounds, ounces, liters, milliliters, pints, quarts, gallons, hours, minutes, and seconds. For this standard we would not include problems with feet and inches regardless of the need for conversion. **Mathematical Fluency** is more than a quick answer on a timed test. Students demonstrate Fluency when they do mathematics using an ***appropriate strategy*** in a reasonable amount of time, ***knowing multiple processes*** and can apply or adapt strategies to find a correct solution. The student will use and explain multiple strategies to solve multi-step whole number problems with or without context involving the four operations and variables. This would include using estimation to interpret or defend the reasonableness of the answer.		**Sample Stems** Tim's class collected 312 cans for the local food drive. Tonja's class collected two times as much as Tim's and 123 more than Tina's class. How many cans were collected all together? Describe how you could use estimation to confirm your solution. Additional Stems for 4th Grade Found at End of Document.
State Assessment Content Limits/Boundaries - Classroom Work Should Extend Beyond These Limits Limit multiplication problems to whole numbers up to a 4-digit by 1-digit or 2-digit by 2-digit. Limit division problems to whole numbers up to 4-digit dividends and 1-digit divisors.		**Calculator Designation** **NO** – a calculator will not be available for items
DOK Ceiling: 3		
Item Format: Selected Response, Constructed Response, Technology Enhanced		

Grade 4 Mathematics

Mathematics		4.RA.A.3
RA A 3	**Relationships and Algebraic Thinking** **PRIORITY STANDARD** **Use the four operations with whole numbers to solve problems** Solve whole number division problems involving variables in which remainders need to be interpreted, and justify the solution.	

Expectation Unwrapped – the intent of this section is to describe the elements of the expectation, but are NOT additional standards or expectations.

The student will solve whole number division problems with or without context in which remainders need to be interpreted and represent these problems using equations with a letter standing for the unknown quantity.

The student will justify the reasonableness of their solution, including interpreting the remainder.

Mathematical Fluency is more than a quick answer on a timed test. Students demonstrate Fluency when they do mathematics using an ***appropriate strategy*** in a reasonable amount of time, ***knowing multiple processes*** and can apply or adapt strategies to find a correct solution.

The student will use and explain multiple strategies to solve whole number division problems with or without context involving variables in which remainders need to be interpreted.

Sample Stems

Use 314 ÷ n = 39 where n is a whole number and will generate a solution with a remainder of 2. Solve the problem and create a situation in context that represents your problem. Make sure you explain what the remainder means given your context.

Additional Stems for 4th Grade Found at End of Document.

State Assessment Content Limits/Boundaries - Classroom Work Should Extend Beyond These Limits

Limit division problems to whole numbers up to 4-digit dividends and 1-digit divisors.

Calculator Designation

NO – a calculator will not be available for items

DOK Ceiling: 3

Item Format: Selected Response, Constructed Response, Technology Enhanced

Grade 4 Mathematics

Mathematics		4.RA.B.4
RA **B** **4**	**Relationships and Algebraic Thinking** **Work with factors and multiples** Recognize that a whole number is a multiple of each of its factors and find the multiples for a given whole number.	
Expectation Unwrapped – the intent of this section is to describe the elements of the expectation, but are NOT additional standards or expectations. The student will identify factors of a given whole number and will generate multiples for a given whole number.		**Sample Stems** Every 8th person of the first hundred people in line for a concert will get a free T-shirt. Which places in the line will get a T-shirt? Additional Stems for 4th Grade Found at End of Document.
State Assessment Content Limits/Boundaries - Classroom Work Should Extend Beyond These Limits Limit factors of whole numbers through 144. Limit list to up to 5 multiples.		**Calculator Designation** **NO** – a calculator will not be available for items
DOK Ceiling: 3		
Item Format: Selected Response, Constructed Response, Technology Enhanced		

Grade 4 Mathematics

Mathematics		4.RA.B.5
RA **B** **5**	**Relationships and Algebraic Thinking** **Work with factors and multiples** Determine if a whole number within 100 is composite or prime, and find all factor pairs for whole numbers within 100.	

Expectation Unwrapped – the intent of this section is to describe the elements of the expectation, but are NOT additional standards or expectations.

The student will determine which numbers are composite or prime within 100. Composite numbers have more than two distinct factors, e.g., 4, 8, 22, 25. Prime numbers have two distinct factors, one and itself, e.g., 7, 13, 37. The number 1 is neither prime nor composite because it does not fit either criteria.

The student will be able to identify all factor pairs for whole numbers up to 100. Factor pairs may be written as ordered pairs as well as other representations, e.g., factor pairs for 28 could be written as (4, 7), 4 x 7, 4 and 7, or in a T-chart.

Sample Stems

If there are 24 students in a class, how many ways can they be arranged into equal-sized groups?

Additional Stems for 4th Grade Found at End of Document.

State Assessment Content Limits/Boundaries - Classroom Work Should Extend Beyond These Limits

No Limits.

Calculator Designation

NO – a calculator will not be available for items

DOK Ceiling: 3

Item Format: Selected Response, Constructed Response, Technology Enhanced

Grade 4 Mathematics

Mathematics		4.RA.C.6
RA C 6	**Relationships and Algebraic Thinking** **Generate and analyze patterns.** Generate a number pattern that follows a given rule.	**PRIORITY STANDARD**

Expectation Unwrapped – the intent of this section is to describe the elements of the expectation, but are NOT additional standards or expectations.	**Sample Stems**
The student will generate a pattern, a sequence, or series of numbers, when given a particular rule which defines a relationship between the numbers, e.g. a student is given a situation where they need to add 5 to each number starting with 11 and from that they generate 11, 16, 21, 26, 31.	Generate a pattern based on the rule, starts at 13, and grows by adding 7. Additional Stems for 4th Grade Found at End of Document.
State Assessment Content Limits/Boundaries - Classroom Work Should Extend Beyond These Limits Limit patterns to whole numbers less than or equal to 144. Limit patterns to one operation.	**Calculator Designation** **NO** – a calculator will not be available for items
DOK Ceiling: 3	
Item Format: Selected Response, Constructed Response, Technology Enhanced	

Grade 4 Mathematics

Mathematics		4.RA.C.7
RA **C** **7**	**Relationships and Algebraic Thinking** **Generate and analyze patterns.** Use words or mathematical symbols to express a rule for a given pattern.	**PRIORITY STANDARD**

Expectation Unwrapped – the intent of this section is to describe the elements of the expectation, but are NOT additional standards or expectations.

The student will use words or mathematical symbols to express the rule for a given numeric pattern.

Mathematical Fluency is more than a quick answer on a timed test. Students demonstrate Fluency when they do mathematics using an ***appropriate strategy*** in a reasonable amount of time, ***knowing multiple processes*** and can apply or adapt strategies to find a correct solution.

The student will use and explain multiple strategies to solve problems with or without context involving using words or mathematical symbols to express a rule for a given pattern.

Sample Stems

Ned created this function table. What rule did Ned use to create the table?

x	y
1	1
2	4
3	9
4	
	25
6	

Use this rule to complete the table.

Additional Stems for 4th Grade Found at End of Document.

State Assessment Content Limits/Boundaries - Classroom Work Should Extend Beyond These Limits

Limit patterns to whole numbers less than or equal to 144.
Limit patterns to one operation.

Calculator Designation

NO – a calculator will not be available for items

DOK Ceiling: 3

Item Format: Selected Response, Constructed Response, Technology Enhanced

Grade 4 Mathematics

Mathematics		4.GM.A.1
GM A 1	**Geometry and Measurement** **Classify 2-dimensional shapes by properties of their lines and angles.** Draw and identify points, lines, line segments, rays, angles, perpendicular lines and parallel lines.	
Expectation Unwrapped – the intent of this section is to describe the elements of the expectation, but are NOT additional standards or expectations. The student will draw points, lines, line segments, rays, angles (right, acute, or obtuse) and perpendicular and parallel lines. The student will identify these attributes in isolation, in two-dimensional figures, or in contextual situations.		**Sample Stems** Use the provided set of letters in the alphabet to answer the following questions. Which letters of the alphabet have parallel lines? Which letters of the alphabet have perpendicular lines? Do any letters contain both parallel and perpendicular lines? Additional Stems for 4th Grade Found at End of Document.
State Assessment Content Limits/Boundaries - Classroom Work Should Extend Beyond These Limits No Limits.		**Calculator Designation** **NO** – a calculator will not be available for items
DOK Ceiling: 3		
Item Format: Selected Response, Constructed Response, Technology Enhanced		

Grade 4 Mathematics

Mathematics		4.GM.A.2
GM A 2	**Geometry and Measurement** **Classify 2-dimensional shapes by properties of their lines and angles.** Classify two-dimensional shapes by their sides and/or angles.	**PRIORITY STANDARD**

Expectation Unwrapped – the intent of this section is to describe the elements of the expectation, but are NOT additional standards or expectations.	**Sample Stems**
The student will classify two-dimensional shapes by their sides and/or angles, e.g., acute equilateral triangle; if a quadrilateral has two pairs of parallel sides it would be classified as a parallelogram. Students will identify which of these are regular, or shapes where each side and angle are equivalent to each other, e.g., equilateral triangle, square. Note: The focus in 4th grade should be the following shapes: triangles (equilateral, scalene, isosceles, right, acute, obtuse) and quadrilaterals (parallelogram, rectangle, rhombus, square). The trapezoid should also be discussed, but assessments will not target the definition or limited classification where the definition is needed. **Situation regarding the definition of a trapezoid:** Since students across the state have different instructional resources (with two different definitions) the state of Missouri has chosen not to assess students on the definition of a trapezoid. There will be trapezoids on the assessment, but not questions specific to the definition. We suggest that students should be aware of both definitions for trapezoids because the math we study is based upon rules (definitions, theorems, etc.). When those rules are changed or altered, new branches of math are created. This is one of the reasons it is important to understand the "rules" being used and it is something that is exciting about math that new things can be discovered or invented.	Create a t-chart with a 2-D shape on the left side (types of triangles and quadrilaterals). Students list the attributes focusing on the side lengths and/or type of angles on the right-hand side. Additional Stems for 4th Grade Found at End of Document.
State Assessment Content Limits/Boundaries - Classroom Work Should Extend Beyond These Limits No Limits.	**Calculator Designation** **NO** – a calculator will not be available for items
DOK Ceiling: 3	
Item Format: Selected Response, Constructed Response, Technology Enhanced	

Grade 4 Mathematics

Mathematics		4.GM.A.3
GM A 3	**Geometry and Measurement** **Classify 2-dimensional shapes by properties of their lines and angles.** Construct lines of symmetry for a two-dimensional figure.	
Expectation Unwrapped – the intent of this section is to describe the elements of the expectation, but are NOT additional standards or expectations. The student will identify, create, and draw lines of symmetry for any two-dimensional figure, including regular or irregular shapes. In grade 4, constructing lines means to draw them, indicating approximately where the line(s) of symmetry exist. Formal construction is a part of the course of Geometry.		**Sample Stems** Using at least 3-5 pattern blocks, build a shape that has symmetry. Draw the lines of symmetry created with the new shape. Additional Stems for 4th Grade Found at End of Document.
State Assessment Content Limits/Boundaries - Classroom Work Should Extend Beyond These Limits Limit figures to not include circles.		**Calculator Designation** **NO** – a calculator will not be available for items
DOK Ceiling: 3		
Item Format: Selected Response, Constructed Response, Technology Enhanced		

Grade 4 Mathematics

Mathematics		4.GM.B.4
GM **B** **4**	**Geometry and Measurement** **Understand the concepts of angle and measure angles.** Identify and estimate angles and their measure.	**PRIORITY STANDARD**

Expectation Unwrapped – the intent of this section is to describe the elements of the expectation, but are NOT additional standards or expectations.

The student will identify and estimate angles and their measure in problems with or without context.

The student will understand angles as geometric shapes that are formed wherever two rays share a common endpoint, and understand angles with reference to the degrees of a circle.

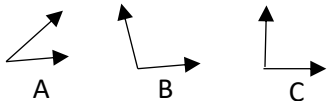
Note:
Identifying (classifying) angles includes right, acute, obtuse, or straight. These angles could occur in isolation, in a two-dimensional figure, or in some problem situation.

Mathematical Fluency is more than a quick answer on a timed test. Students demonstrate Fluency when they do mathematics using an ***appropriate strategy*** in a reasonable amount of time, ***knowing multiple processes*** and can apply or adapt strategies to find a correct solution.

The student will use and explain multiple strategies to solve problems with or without context involving identifying and estimating angle measures.

Sample Stems

Juan used a protractor to measure the angles below. Which angle is about 30 degrees?



Additional Stems for 4th Grade Found at End of Document.

State Assessment Content Limits/Boundaries - Classroom Work Should Extend Beyond These Limits

Limit to degrees from zero up through one hundred eighty.

Calculator Designation

NO – a calculator will not be available for items

DOK Ceiling: 3

Item Format: Selected Response, Constructed Response, Technology Enhanced

Grade 4 Mathematics

Mathematics		4.GM.B.5
GM B 5	**Geometry and Measurement** **Understand the concepts of angle and measure angles.** Draw and measure angles in whole-number degrees using a protractor.	
Expectation Unwrapped – the intent of this section is to describe the elements of the expectation, but are NOT additional standards or expectations. The student will draw and measure angles in whole-number degrees using a protractor. The student will understand angles as geometric shapes that are formed wherever two rays share a common endpoint, and understand angles are measured with reference to the degrees of a circle.		**Sample Stems** Without a protractor, draw an acute, right, and obtuse angle. Estimate its angle measure. Then measure each angle with a protractor and record its angle measurement. How close was your estimate to the actual measure? Additional Stems for 4th Grade Found at End of Document.
State Assessment Content Limits/Boundaries - Classroom Work Should Extend Beyond These Limits Limit drawing angles with protractors to measurements of multiples of ten degrees. Limit to degrees from zero up through one hundred eighty.		**Calculator Designation** **NO** – a calculator will not be available for items
DOK Ceiling: 3		
Item Format: Selected Response, Constructed Response, Technology Enhanced		

Grade 4 Mathematics

Mathematics		4.GM.C.6.a
GM	**Geometry and Measurement**	
C	**Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.**	
6	Know relative sizes of measurement units within one system of units.	
a	Convert measurements in a larger unit in terms of a smaller unit.	

Expectation Unwrapped – the intent of this section is to describe the elements of the expectation, but are NOT additional standards or expectations.	**Sample Stems**
The student will know relative sizes of measurement units within one system of units limited to inches, feet, yards, miles, millimeters, centimeters, meters, kilometers, grams, kilograms, ounces, pounds, milliliters, liters, pints, quarts, gallons, seconds, minutes, and hours. Within a single system of measurement, express measurements of a larger unit in terms of a smaller unit given the equivalent unit conversion, e.g., know that 1 ft. is 12 times as long as 1 in., express the length of a 4 ft. snake as 48 in.	Marco and Anna were selling lemonade to make money for their local pet shelter. Marco sold 5 gallons of lemonade and Anna sold 38 pints. Who sold more lemonade? How much more? Additional Stems for 4th Grade Found at End of Document.
State Assessment Content Limits/Boundaries - Classroom Work Should Extend Beyond These Limits No Limits.	**Calculator Designation** **NO** – a calculator will not be available for items
DOK Ceiling: 3	
Item Format: Selected Response, Constructed Response, Technology Enhanced	

Grade 4 Mathematics

Mathematics		4.GM.C.7
GM C 7	**Geometry and Measurement** **PRIORITY STANDARD** **Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.** Use the four operations to solve problems involving distances, intervals of time, liquid volume, weight of objects and money.	

Expectation Unwrapped – the intent of this section is to describe the elements of the expectation, but are NOT additional standards or expectations.

The student will use the four operations to solve problems with or without context involving distances, elapsed time, liquid volume, money, and weight of objects, including problems involving simple fractions or decimals.

Note:
The student would be expected to solve problems with mixed units, e.g., 3 yards and 2 feet plus 2 yards and 2 feet. The focus is on understanding the relationship and not putting the solution in a particular form (equivalent forms are accepted).

Mathematical Fluency is more than a quick answer on a timed test. Students demonstrate Fluency when they do mathematics using an ***appropriate strategy*** in a reasonable amount of time, ***knowing multiple processes*** and can apply or adapt strategies to find a correct solution.

The student will use and explain multiple strategies to solve problems with or without context involving distances, intervals of time, liquid volume, weight of objects and money.

Sample Stems

Mikah and Logan each went to a show at the art museum. Mikah saw a show that lasted 48 minutes. Logan saw a show that lasted 41 minutes. Identify which show each saw and what was the show that lasted the longest?

ART MUSEUM SHOWS		
Show	Start Time	End Time
Pottery	10:15 am	10:46 am
Weaving	11:25 am	12:13 pm
Folk Arts	1:15 pm	2:21 pm
Painting	3:35 pm	4:36 pm

Additional Stems for 4th Grade Found at End of Document.

State Assessment Content Limits/Boundaries - Classroom Work Should Extend Beyond These Limits

Limit multiplication problems to whole numbers up to a 4-digit by 1-digit or 2-digit by 2-digit.
Limit division problems to whole numbers up to 4-digit dividends and 1-digit divisors.

Calculator Designation

NO – a calculator will not be available for items

DOK Ceiling: 3

Item Format: Selected Response, Constructed Response, Technology Enhanced

Grade 4 Mathematics

Mathematics		4.GM.C.8
GM C 8	**Geometry and Measurement** **PRIORITY STANDARD** **Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.** Apply the area and perimeter formulas for rectangles to solve problems.	

Expectation Unwrapped – the intent of this section is to describe the elements of the expectation, but are NOT additional standards or expectations.	**Sample Stems**
The student will apply the area and perimeter formulas for rectangles in problems with or without context. **Mathematical Fluency** is more than a quick answer on a timed test. Students demonstrate Fluency when they do mathematics using an ***appropriate strategy*** in a reasonable amount of time, ***knowing multiple processes*** and can apply or adapt strategies to find a correct solution. The student will use and explain multiple strategies to solve problems with or without context involving the use of area and perimeter formulas for rectangles.	Mia needs to build a pen for her pet pig. She has 36 feet of fencing to create the pen. She has designed two pens for her pig. One of the pens would be 5 feet wide. The other pen would be 9 feet long. Mia wants the pen to have the greatest area possible for her pig. Which choice should Mia make? What would be the area of the pen Mia should build? Additional Stems for 4th Grade Found at End of Document.
State Assessment Content Limits/Boundaries - Classroom Work Should Extend Beyond These Limits Limit units to whole numbers. Limit division problems to whole numbers up to 4-digit dividends and 1-digit divisors.	Calculator Designation NO – a calculator will not be available for items
DOK Ceiling: 3	
Item Format: Selected Response, Constructed Response, Technology Enhanced	

Grade 4 Mathematics

Mathematics		4.DS.A.1
DS **A** **1**	**Data and Statistics** **Represent and analyze data** Create a frequency table and/or line plot to display measurement data.	

Expectation Unwrapped – the intent of this section is to describe the elements of the expectation, but are NOT additional standards or expectations.

The student will display measurement data in a frequency table and/or line plot.

Note:
A line plot is a graph that displays data as points above a number line showing the frequency of each value in a data set, e.g., each student measured the length of their own pencil.

Sample Stems

Simone measured the lengths of the erasers on seven different pencils. Each pencil was a different color. She made a list of her measurements. Show this data on a line plot. How many erasers did Simone measure that were less than $\frac{1}{2}$ inch long?

Blue - $\frac{1}{2}$ in., Red - $\frac{1}{8}$ in., Green - $\frac{1}{4}$ in., Yellow - $\frac{1}{2}$ in., Orange - $\frac{3}{8}$ in., Purple - $\frac{1}{4}$ in., Teal - $\frac{1}{4}$ in.

Additional Stems for 4th Grade Found at End of Document.

State Assessment Content Limits/Boundaries - Classroom Work Should Extend Beyond These Limits

Limit data displays to whole numbers or fractions less than one (inclusive).

Calculator Designation

NO – a calculator will not be available for items

DOK Ceiling: 3

Item Format: Selected Response, Constructed Response, Technology Enhanced

Grade 4 Mathematics

Mathematics	4.DS.A.2
DS A 2	**Data and Statistics** **Represent and analyze data** Solve problems involving addition and subtraction by using information presented in a data display.

Expectation Unwrapped – the intent of this section is to describe the elements of the expectation, but are NOT additional standards or expectations.

The student will solve problems involving addition and subtraction by using information presented in a data display, e.g., line plot, bar graph, picture graph, frequency table.

Sample Stems

This table shows the lengths of different bridges around the world. How much longer is the Confederation Bridge than the Brooklyn Bridge?

Lengths of Bridges Around the World

Name of Bridge	Location	Length in Feet
Brooklyn Bridge	New York, USA	5,989
Confederation Bridge	Prince Edward Island to New Brunswick, Canada	42,323
Pearl Bridge	Kobe, Japan	12,831
Sydney Harbor Bridge	Sydney, Australia	3,770
Digha–Sonpur Bridge	Bihar, India	14,948

Additional Stems for 4th Grade Found at End of Document.

State Assessment Content Limits/Boundaries - Classroom Work Should Extend Beyond These Limits

Limit fractions to like denominators.
Limit data displays to whole numbers or fractions less than one (inclusive).

Calculator Designation

NO – a calculator will not be available for items

DOK Ceiling: 3

Item Format: Selected Response, Constructed Response, Technology Enhanced

Grade 4 Mathematics

Mathematics		4.DS.A.3
DS **A** **3**	**Data and Statistics** **Represent and analyze data** Analyze the data in a frequency table, line plot, bar graph or picture graph.	**PRIORITY STANDARD**

Expectation Unwrapped – the intent of this section is to describe the elements of the expectation, but are NOT additional standards or expectations.

The student will analyze the data, e.g., review data displays and identify characteristics in the data. These characteristics could include how often the values occur, observing patterns in the data, developing questions from the data, making predictions using the data and determining the mode and range.

Mathematical Fluency is more than a quick answer on a timed test. Students demonstrate Fluency when they do mathematics using an ***appropriate strategy*** in a reasonable amount of time, ***knowing multiple processes*** and can apply or adapt strategies to find a correct solution.

The student will use and explain multiple strategies to solve problems with or without context involving analyzing the data in a frequency table, line plot, bar graph or picture graph.

Sample Stems

The frequency table listed below was collected from 3 classrooms in your school asking about their favorite type of pet.

Dog	𝍸 𝍸 𝍸 𝍸
Cat	𝍸 𝍸 𝍸 |
Rabbit	𝍸
Fish	𝍸 𝍸
Snake	||||
None	𝍸

Use the data from the table to predict which type of pet would be the favorite of your classroom and the range of possible tally marks that pet would receive.

Additional Stems for 4th Grade Found at End of Document.

State Assessment Content Limits/Boundaries - Classroom Work Should Extend Beyond These Limits

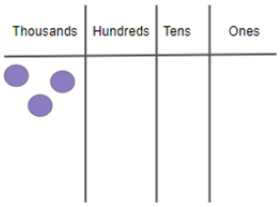
Limit fractions to like denominators.
Limit data displays to whole numbers or fractions less than one (inclusive).

Calculator Designation

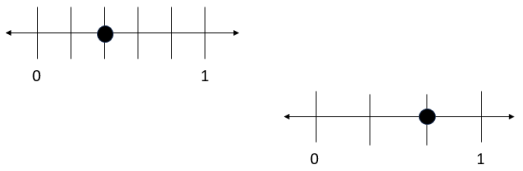
NO – a calculator will not be available for items

DOK Ceiling: 3

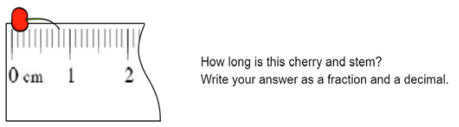
Item Format: Selected Response, Constructed Response, Technology Enhanced

Code	Sample Stem	Explanation
4.NBT.A.1	Dillon has 3,674 baseball cards in his collection. Kayla has 457 less. What are some ways to round the numbers to estimate the number of cards they have together? Explain how your rounding could impact the estimation.	
4.NBT.A.2	Arrowhead Stadium will hold seventy-six thousand, four hundred sixteen people. Trinity writes this number as 76,000,416. Kevin writes 76,000 + 416. Aerick writes 70,000 + 6,000 + 400 + 16. Dutton writes 7 ten thousands + 6 thousands + 4 hundreds + 16 ones. Sky writes 76,416. Identify all the people that represented the number accurately and explain any errors some students might have made.	
4.NBT.A.3	Use digits 1, 2, 3, 4, 6, 7, 8, 9 exactly once to make the following true: _ _ _ _ > _ _ _ _ Now replace one digit with a 5 so that the > sign would have to become a < sign to make the statement true. Which digit did you change and why?	
4.NBT.A.4	Using the place value chart below, show the same value in the hundreds place.  	
4.NBT.A.5	Toni and Jeni are working to solve problems and explain their reasoning. Looking at 527 + 391 Toni sees 3 different strategies to find a solution. Jeni sees 4 strategies. What are some strategies to solve this problem? How are the strategies selected similar or different if the problem was changed to be 527 – 391 ?	

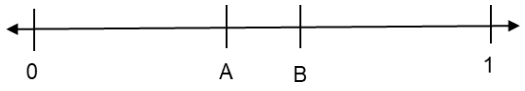
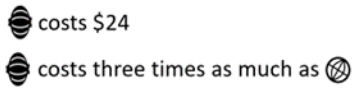
Grade 4 Mathematics

Code	Sample Stem	Explanation
4.NBT.A.6	Find the product of the following problem and use equations, rectangular arrays, area models to help justify your solution. 27 x 23	
4.NBT.A.7	Two students are discussing whether 4,537 ÷ 5 will or will not have a remainder. Without calculating the solution, explain how they will know. Use words, numbers, or models to help explain your reasoning.	
4.NF.A.1	Jenny says that $\frac{1}{4}$ is equal to $\frac{2}{5}$ because she added one to both the numerator and denominator. Do you agree that $\frac{1}{4}$ is equal to $\frac{2}{5}$? Explain why or why not using pictures, words, models.	
	How can you prove that $\frac{3}{4}$ has the same value as $\frac{6}{8}$? Use pictures or models to support your reasoning.	
4.NF.A.2	Write two or more fractions that the point on each number line represents. Explain your reasoning. 	
	Students are working to determine whether two fractions are equivalent. One group is working on the fractions $\frac{9}{12}$ and $\frac{6}{8}$. Use words, numbers, or models to help explain whether these fractions are equivalent.	
4.NF.A.3	Using the numbers 2, 3, 4 and 5 exactly one time, place these numbers in the boxes to make each sentence true. $\frac{\square}{\square} > \frac{2}{3}$ $\frac{\square}{\square} < \frac{1}{2}$ What other arrangement of numbers will make each sentence true? Use words, pictures, number lines or other strategies to justify how you know.	

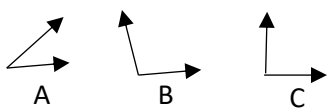
	Katie and Heather each had the same grid to color using any pattern they wished. Katie colored $\frac{2}{3}$ of her grid and Heather colored $\frac{2}{5}$ of hers. Who colored more? Use words pictures, number lines, math sentences or other strategies to justify how you know.	
	During track practice, Linda ran $\frac{5}{6}$ of a mile and Cathy ran $\frac{7}{8}$ of a mile. Who ran farther? Use words pictures, number lines, math sentences or other strategies to justify your solution.	
Code	Sample Stem	Explanation
4.NF.B.4	Decompose the fraction $\frac{7}{8}$ in two different ways.	
	Tom cuts a cake into 6 pieces. He gives away 4 pieces. What fraction of the cake did he give away? What fraction is remaining? Write an equation to represent this situation.	
	Josh used ¼ of a jug of milk to make a cake at his house. Kate used ¼ of a carton of milk for making cookies at her house. Kate said that in all, they used ½ of a container. Is that a true statement? Why or why not?	Make sure students understand we can only add/subtract fractions when they are the same whole.
4.NF.B.5	Represent the fraction $\frac{7}{10}$ using a model. Decompose the fraction $\frac{7}{10}$ in two different ways and represent in your model.	
	Katie and Jason ate $\frac{7}{8}$ of a pizza together. What are the different possibilities of what each person might have eaten? Represent your possibilities with an equation.	
4.NF.B.6	Jason made brownies for the guests at his family's picnic. At the picnic, the guests ate $\frac{5}{12}$ of the brownies. Later that night, the family ate more of the brownies. The next morning, $\frac{5}{12}$ of the brownies were left in the pan. How much of the brownies did the family eat later that night? What is another fraction you can write that is equal to this fraction?	

	Use words, a picture, a number line, a math sentences or other math strategies to show the answer to the following equation. $\frac{3}{6}+\frac{1}{6}$=?	
Code	Sample Stem	Explanation
4.NF.B.7	Jay drew this model to represent 3 x $\frac{1}{5}$ What is the answer?  Explain how you know.	
4.NF.B.8	Linda feeds each of her three rescue dogs three scoops of dog food per day. Each scoop is $\frac{2}{3}$ cup. How much dog food does each dog receive? Support your solution by using a concrete, pictorial, or symbolic representation.	Classroom discussions should provide opportunities for students to see alternative representations supporting conclusions. This would allow time to consider different strategies for future situations.
4.NF.C.9	Amy says $\frac{3}{10}$ can be written as the decimal 0.30. Is Amy correct? Explain why or why not.	
4.NF.C.10		
	Use words, pictures, drawings, math sentences or other math strategies to show that $\frac{65}{100}$ is equivalent to .65	Another option would be: How can you use visual models to show that $\frac{65}{100}$ is equivalent to .65?
4.NF.C.11	Describe the differences between the following two numbers. 8.67 8.76 Use the number names, place values to help support your descriptions.	

Grade 4 Mathematics

Code	Sample Stem	Explanation
4.NF.C.12	Joe and Ella estimated the height of a bench. Joe estimated that it was 0.6 m tall. Ella estimated that it was 0.48 m tall. They marked their estimates on the number line below.  Identify which mark belongs to each student and justify your selection.	
4.RA.A.1	**Lou is using beads to make a bracelet.**  **How much does Lou's bracelet cost?**  Brad ran 5 laps. Gerry ran three times as many laps as Brad. How many laps did Gerry run?	
4.RA.A.2	Tim's class collected 312 cans for the local food drive. Tonja's class collected two times as much as Tim's and 123 more than Tina's class. How many cans were collected all together? Describe how you could use estimation to confirm your solution.	
4.RA.A.3	Use 314 ÷ n = 39 where n is a whole number and will generate a solution with a remainder of 2. Solve the problem and create a situation in context that represents your problem. Make sure you explain what the remainder means given your context.	
4.RA.B.4	Every 8th person of the first hundred people in line for a concert will get a free T-shirt. Which places in the line will get a T-shirt?	
4.RA.B.5	If there are 24 students in a class, how many ways can they be arranged into equal-sized groups?	
4.RA.C.6	Generate a pattern based on the rule, starts at 13, and grows by adding 7.	

Grade 4 Mathematics

Code	Sample Stem	Explanation
4.RA.C.7	Ned created this function table. What rule did Ned use to create the table? **x** | **y** 1 | 1 2 | 4 3 | 9 4 | | 25 6 | Use this rule to complete the table.	
4.GM.A.1	Draw two points and label them A and B. Connect them with a line segment. Draw another point not on $\overline{AB}$ and label it C. Draw a ray from A to C and label it $\overrightarrow{AC}$. Pick a fourth point not on $\overline{AB}$ or $\overrightarrow{AC}$ and label it D. Draw an angle between D, C, and A and label it $\angle DCA$.	
	What makes a line different from a line segment?	
	Use the provided set of letters in the alphabet to answer the following questions. Which letters of the alphabet have parallel lines? Which letters of the alphabet have perpendicular lines? Do any letters contain both parallel and perpendicular lines?	For this task, students will need a copy of the alphabet. Depending on the font used for the alphabet list, some answers could vary.
4.GM.A.2	Create a t-chart with a 2-D shape on the left side (types of triangles and quadrilaterals). Students list the attributes focusing on the side lengths and/or type of angles on the right-hand side.	
4.GM.A.3	Which letters of the alphabet have symmetry? Draw the line(s) of symmetry to support your answers.	For this task, students will need a copy of the alphabet. Depending on the font used for the alphabet list, some answers could vary.
	Using at least 3-5 pattern blocks, build a shape that has symmetry. Draw the lines of symmetry created with the new shape.	For this task, students will need pattern blocks.
4.GM.B.4	Juan used a protractor to measure the angles below. Which angle is about 30 degrees?  	

Grade 4 Mathematics

<table>
<tr><th>Code</th><th>Sample Stem</th><th>Explanation</th></tr>
<tr><td>4.GM.B.5</td><td>Without a protractor, draw an acute, right, and obtuse angle. Estimate its angle measure. Then measure each angle with a protractor and record its angle measurement. How close was your estimate to the actual measure?</td><td></td></tr>
<tr><td>4.GM.C.6a</td><td>Marco and Anna were selling lemonade to make money for their local pet shelter. Marco sold 5 gallons of lemonade and Anna sold 38 pints. Who sold more lemonade? How much more?</td><td></td></tr>
<tr><td>4.GM.C.7</td><td>Mikah and Logan each went to a show at the art museum. Mikah saw a show that lasted 48 minutes. Logan saw a show that lasted 41 minutes. Identify which show each saw and what was the show that lasted the longest?

<table>
<tr><th colspan="3">ART MUSEUM SHOWS</th></tr>
<tr><th>Show</th><th>Start Time</th><th>End Time</th></tr>
<tr><td>Pottery</td><td>10:15 am</td><td>10:46 am</td></tr>
<tr><td>Weaving</td><td>11:25 am</td><td>12:13 pm</td></tr>
<tr><td>Folk Arts</td><td>1:15 pm</td><td>2:21 pm</td></tr>
<tr><td>Painting</td><td>3:35 pm</td><td>4:36 pm</td></tr>
</table></td><td></td></tr>
<tr><td rowspan="2">4.GM.C.8</td><td>Mia needs to build a pen for her pet pig. She has 36 feet of fencing to create the pen. She has designed two pens for her pig. One of the pens would be 5 feet wide. The other pen would be 9 feet long. Mia wants the pen to have the greatest area possible for her pig. Which choice should Mia make? What would be the area of the pen Mia should build?</td><td></td></tr>
<tr><td>Given a perimeter of 32, find all possible rectangles. Identify which rectangle creates the largest area?</td><td></td></tr>
<tr><td>4.DS.A.1</td><td>Simone measured the lengths of the erasers on seven different pencils. Each pencil was a different color. She made a list of her measurements. Show this data on a line plot. How many erasers did Simone measure that were less than 1/2 inch long? Blue - 1/2 in., Red - 1/8 in., Green - 1/4 in., Yellow - 1/2 in., Orange - 3/8 in., Purple - 1/4 in., Teal - 1/4 in.</td><td></td></tr>
</table>

Grade 4 Mathematics

<table>
<tr><th>Code</th><th>Sample Stem</th><th>Explanation</th></tr>
<tr><td>4.DS.A.2</td><td>This table shows the lengths of different bridges around the world. How much longer is the Confederation Bridge than the Brooklyn Bridge?
<table>
<tr><th colspan="3">Lengths of Bridges Around the World</th></tr>
<tr><th>Name of Bridge</th><th>Location</th><th>Length in Feet</th></tr>
<tr><td>Brooklyn Bridge</td><td>New York, USA</td><td>5,989</td></tr>
<tr><td>Confederation Bridge</td><td>Prince Edward Island to New Brunswick, Canada</td><td>42,323</td></tr>
<tr><td>Pearl Bridge</td><td>Kobe, Japan</td><td>12,831</td></tr>
<tr><td>Sydney Harbor Bridge</td><td>Sydney, Australia</td><td>3,770</td></tr>
<tr><td>Digha–Sonpur Bridge</td><td>Bihar, India</td><td>14,948</td></tr>
</table></td><td>Teachers might consider using the playground to possibly model or show the length of each bridge, so students also can develop a sense of how long these bridges measure.</td></tr>
<tr><td>4.DS.A.3</td><td>The frequency table listed below was collected from 3 classrooms in your school asking about their favorite type of pet.
<table>
<tr><td>Dog</td><td>𝍸 𝍸 𝍸 𝍸</td></tr>
<tr><td>Cat</td><td>𝍸 𝍸 𝍸 |</td></tr>
<tr><td>Rabbit</td><td>𝍸</td></tr>
<tr><td>Fish</td><td>𝍸 𝍸</td></tr>
<tr><td>Snake</td><td>||||</td></tr>
<tr><td>None</td><td>𝍸</td></tr>
</table>
Use the data from the table to predict which type of pet would be the favorite of your classroom and the range of possible tally marks that pet would receive.</td><td></td></tr>
</table>